

Date: April 2, 2014

Testimony of Dr. Jyothi Rangineni, on behalf of Tile Council of North America (TCNA)

Docket No. OSHA-2010-0034

Occupational Exposure to Respirable Crystalline Silica; Proposed Rule

Good Afternoon,

My name is Dr. Jyothi Rangineni and I work as a Research Scientist at Tile Council of North America (TCNA). I have a Ph.D. in Microbiology (specializing in neutraceuticals) from Clemson University, SC. In addition to microbiological research I am also involved in the development of industry standards. I am leading the effort to develop an International Standards Organization (ISO) standard for quantifying antibacterial activity of treated ceramic surfaces and also lead the effort to develop a protocol to evaluate the hypoallergenic qualities of tile and installation products.

I would like to focus my testimony on two issues:

- Toxicity of Forms of Silica in Raw Materials
- Studies on Workplace Risk in Tile and Heavy Clay Industries

### **Toxicity of Forms of Silica in Raw Materials**

Clay raw materials used in tile manufacturing are similar to those used in brick and sanitary ware manufacturing. Silica in clay is embedded in the matrices of aluminosilicates comprising the clay, which decreases the bio-availability of the silica molecule to attach to pulmonary tissue by modifying the surface of the silica. The decrease in fibrogenic potency and toxicity when exposure occurs in the form of aluminum-rich clay has been documented to be due to the binding of aluminum ions to the surface silanol groups of quartz by Donaldson & Borm in their study titled: *The quartz hazard: A variable entity*.



The presence of aluminum adds a second advantage in its ability to clear the particles from lungs at a faster rate, as described by Begin et al in their study titled: *Late aluminum therapy reduces the cellular activities of simple silicosis in the sheep model*. In their study, they demonstrated that aluminum treatment of quartz significantly reduces the biological activity of quartz and increases its clearance with essentially no detectable particle retention in the lung 10 months after exposure. Lung clearance half lives of 145 days for pure quartz treatment and 30 days for aluminum combined quartz treatment were reported in their sheep models.

A more critical and important study by Tourmann and Kaufmann has reported such coating of quartz by aluminum in clay is long lasting and their studies revealed the intact coated particles recovered by ashing the lungs of coal miners who had died 40-50 years back.

In the risk assessment of silica exposures, we would like to point out that the models used by OSHA to establish exposure limits are based on pure quartz and do not represent such “unavailable” occluded silica of clay raw materials. These studies of unoccluded native quartz have no significance to the complex clay matrices used in tile manufacturing. While it is not our standpoint that crystalline silica in such clay raw material is harmless, but rather that the harmful effects are reduced due to its existence as molecules in combination with aluminum.

### **Studies on Workplace Risk in Tile and Heavy Clay Industries**

An extensive review of medical literature on the silica exposure risks in brick industries reveals a decline in reported silicosis cases. Beginning with two studies conducted in 1939 and 1941 by West Virginia State Health Department and North Carolina Brick Industry respectively, the decreased risk of exposure in these industries has been well documented. These studies were conducted in different facilities which included brick and wall and floor tile and revealed 2 cases of silicosis in the 1939 study and none in the 1941 study prompting the author to report that:

*“The examination of the workers in brick and tile plants was expected to reveal the existence of pulmonary pathology that could be attributed to the inhalation of dust.”*



The author concluded his study with:

*“The total absence of silicosis and other serious pulmonary pathology and the low incidence of other respiratory diseases among 1555 brick and tile plant workers indicate that exposure to dust in the North Carolina industry does not constitute a serious menace to health.”*

Between 1960s – 1970s dust exposures were reduced across all industries, resulting in a sharp decrease of reported silicosis cases. CDC reports indicate that the mortality and morbidity declined significantly over the years from 1157 silicosis related deaths in 1968 to 148 silicosis deaths in 2002. In 2006 Brick Industry Association (BIA) sponsored and conducted a study to determine the prevalence of silicosis among brick industry workers. The study revealed the brick workers were not at a risk for silicosis at present levels of exposure. Additionally, TCNA’s largest tile and mortar-producing members reported no silicosis cases confirmed in the past 15 years (or longer) reaffirming the fact that stricter regulations are not required.

As mentioned earlier, the raw materials used in tile formulations include clays similar to that used in brick formulations. However for tile, the percentage of quartz in the raw materials is commonly less than 10% and less than typically found in bricks and structured clay products.

As the silica present in ceramic tile differs appreciably from the free crystalline silica OSHA intends to further regulate, tile manufacturing should not be included in the category of affected industries listed by OSHA in the proposed new rule. We request that should separate provisions reflecting the reduced cytotoxicity of aluminosilicates be considered for other industries using clay raw materials, the same be considered for the tile manufacturing industry.

Thank you for this opportunity to provide testimony.

Best regards,



Dr. Jyothi Rangineni  
Tile Council of North America

